Based Upon: PCT/RU2005/000069

AMENDMENT TO THE CLAIMS

1. (Currently Amended) [[Method]] A method for storing underground cologically dangerous substances[[,]] which at least one of are located in containers ~~and/or~~ and are open products containing the ~~such~~ substances, ~~as well as many~~ and an other ~~specific~~ storage objects, the method comprising:

~~characterised in that~~

~~the~~ a storage ~~takes place~~ occurring at least one of in deep boreholes and ~~and/or in~~ shafts with borehole pipes ~~which are~~ sealed and into which the storage objects are brought through a lock device~~, for example through lock devices known per se~~, the storage objects being ~~arranged beforehand~~ pre-arranged in technological secondary containers ~~which are~~ open at ~~the~~ a bottom and ~~represent~~ representing structurally altered caissons, and ~~thereafter these~~ then the caissons[[,]] with the storage objects ~~arranged in them,~~ are placed ~~the~~ one on top of the other inside a pipe liner in the borehole while avoiding lifts and other conventional mechanical devices ~~such as shaft elevators or lifts~~, and ~~in that~~ for operating ~~all~~ the ~~known~~ underground objects, ~~preferably for~~ including all the necessary loading and unloading operations inside the borehole, a gas-hydrodynamic complex system is used ~~with the aid of which~~ and structural elements going into ~~the~~ a stock of ~~this~~ a system and functional subsystems of ~~this~~ the system are controlled remotely.

2. (Currently Amended) The method ~~Method~~ according to claim 1, wherein

~~characterised in that~~

the gas-hydrodynamic complex system combines functionally three main system groups, including ~~specifically~~ a hydraulic subsystem and a gas subsystem ~~which are both provided with~~ each having devices ~~which are known per~~

~~se but perfected~~, and a third subsystem which includes ~~the~~ one of a lock device ~~of the type known per se or of~~ and a structurally perfected lock device ~~type provided~~ for specific storage objects, ~~and also the above mentioned technological~~ caissons ~~which, however,~~ are designed with a specific ~~special~~ structural feature ~~as a result of which the functionally most important~~ with an action [[is]] carried out ~~with the aid of~~ by the ~~created~~ gas-hydrodynamic complex system in the caissons, ~~namely~~ including a target calculation in which [[the]] a value of [[the]] a positive buoyancy of the caissons used with the storage objects arranged in them is set by a remote control, which leads ~~this action relating in principle~~ to a random depth of [[the]] a following forced immersion into a random fluid medium with which the borehole ~~has been previously~~ is filled.

3. (Currently Amended) The method ~~Method~~ according to ~~claims~~ claim 1 ~~and 2~~, wherein

~~characterised in that~~

[[-]] ~~with the aid of~~ the gas-hydrodynamic system~~, the remote controlled~~ operates loading of the borehole storage site with the technological caissons so ~~takes place in principle in~~ that ~~the~~ an entire interior of the sealed borehole pipe liner, even up to ~~where it emerges~~ a position for emerging from the hydraulic subsystem, is filled with ~~some~~ a technological fluid~~, for example with water or some other fluid which is especially most~~ compatible chemically with ~~the~~ stored substances and materials ~~which are~~ used ~~overall~~ in ~~the~~ construction of the storage site,

[[-]] ~~thereafter, with the aid of~~ then the ~~above mentioned~~ third subsystem[[,]] first loads the lower caisson ~~with the special feature is first loaded~~ via the lock device into the borehole[[,]] which is flooded by the technological fluid,

[[-]] ~~no storage objects are arranged in this~~ the lower caisson is free from the storage objects and [[it]] is constructed to ~~retain the~~ have a positive buoyancy ~~right~~ up to a maximum immersion directly to the bottom of the borehole,

[[-]] ~~thereafter this~~ then the lower caisson is plunged ~~by this means~~ into the technological fluid in the borehole,

[[-]] on top of [[it]] the lower caisson is placed~~, again~~ with the ~~aid of the~~ lock device having an appropriate ram~~, the~~ a second technological caisson ~~with~~ having the storage objects ~~in it~~ and having ~~with~~ a relatively lower value~~, calculated for it,~~ of the ~~original~~ positive buoyancy,

[[-]] the third caisson is placed in a similar manner ~~etc.~~ until the entire calculated set of caissons ~~has been~~ is submerged in the technological fluid located inside the borehole and ~~correspondingly~~ the technological fluid which is displaced from the borehole is ~~has been~~ led into an external collector of one of the hydraulic subsystem ~~or into some other, for example~~ another adjoining[[,]] borehole one of ~~which is being~~ prepared for future loading ~~or is~~ and located in the unloading area,

[[-]] ~~in the course of the above-mentioned actions, the~~ a reduced[[,]] ~~summary,~~ overall positive buoyancy~~, arising according to the~~ resulting from a submersion of [[the]] caissons[[,]] of the entire vertical caisson assembly provided is constantly monitored and then [[the]] a buoyancy value is obtained by a calculation ~~with the aid~~ in view of the monitoring,

[[-]] then the gas subsystem starts,

[[-]] into [[the]] calculated depths inside the borehole[[,]] one of air [[or]] and some other chemically preferred gas for the storage objects, including one of ~~preferably~~ nitrogen, argon [[or]] and helium, is led through [[the]] a layer of technological fluid into the lower caisson, and

[[-]] ~~with the above-mentioned inter-connected actions, the in-put~~ an input positive buoyancy of the entire vertical caisson assembly ~~provided~~ is

maintained according to [[its]] a submersion until the lower caisson strikes the borehole bottom and ~~thus the~~ a calculated remote-controlled loading of the borehole with the caissons having the storage objects ~~in them~~ is terminated.

4. (Currently Amended) The method ~~Method~~ according to claim 1 [[or 2]], wherein

~~characterised in that~~

[[-]] for creating a ~~condition of "dry"~~ dry storage condition in the borehole storage site, on termination of [[the]] loading of the deep borehole, [[the]] a mouth of the borehole is hermetically sealed with an appropriate blocking device, using the gas-hydrodynamic control system, the

[[-]] ~~in that~~ gas is led into [[the]] an interior of the pipe liner from the gas subsystem under such pressure that [[the]] removal of the technological fluid used from the interior of the borehole is guaranteed by ~~means of "pressing out"~~ a pressing out to [[the]] an outside through peripheral pipe ducts ~~which are~~ secured ~~for this purpose~~ to [[the]] a lower base portion of the borehole[[,]] and communicating vessels are ~~of sorts being~~ produced,

[[-]] ~~after this~~ then a final removal of the technological fluid into the external collectors~~, these~~ peripheral pipe ducts are [[also]] hermetically sealed, and

[[-]] ~~in that, furthermore,~~ inside the ~~storage~~ borehole a technologically recommended excess pressure is generated of [[that]] the gas which is [[also]] selected for technological reasons for a ~~the~~ completed formation of [[the]] an appropriately dry ~~"dry"~~ protective atmosphere in the borehole storage site.

5. (Currently Amended) The method ~~Method~~ according to claim 1 [[or 2]], wherein when

~~characterised in that~~

~~the processes of~~ unloading from the borehole storage site the caissons containing the storage objects, using the gas-hydrodynamic system, ~~are realised in the following manner:~~

[[-]] first[[,]] in the borehole[[,]] the pressure of the gas protective atmosphere previously established ~~in it~~ is lowered to [[the]] a calculated value, ~~preferably~~ to the external atmospheric pressure,

[[-]] ~~thereafter,~~ from the hydraulic subsystem the borehole is filled with the technological fluid in [[its]] a base portion~~, for which purpose~~ by the peripheral pipe ducts are used, and

[[-]] simultaneously~~, also~~ and from the base portion[[,]] a sparging gas is led from the gas subsystem into the lower caisson ~~which is~~ so ~~designed~~ that the gas ~~also~~ flows ~~in turn~~ into all the caissons arranged on top, ~~by which means,~~ creating in the entire vertical caisson assembly~~, that~~ the calculated positive buoyancy ~~is created as a result of which the~~ resulting at least one of a controlled general rising of [[the]] an entire caisson column up to [[the]] at least one of an upper mouth of the borehole ~~and/or up to the~~ an entrance into the lock device ~~is also caused~~, out of which the caissons are guided cyclically by ~~means of~~ appropriate gripping mechanisms in control rooms, ~~and by which means,~~ inside [[the]] an underground bunker[[,]] an equipment check of the caissons and the storage objects located in them takes place for one of formulating a summary decision ~~or for~~ and extending the deep storage ~~(for some of them), for example in the adjoining borehole storage site or for delivering storage objects to be removed from the bunker according to a corresponding stipulation, preferably~~ for technological processing.

6. (Currently Amended) The method ~~Method~~ according to claim 1 [[or 2]], wherein for dissipating

~~characterised in that~~

~~in those cases in which~~ heat ~~absolutely must be dissipated~~ from the storage objects~~, for example from the radioactive waste or from the spent fuel elements and also from weapons grade plutonium and other radioactive materials,~~ in [[the]] a construction of the borehole storage site ~~the known~~ a physical effect of a [["]]super heat conductivity[["]] is ~~realised and in that, inside~~ accomplished by the borehole [[is]] arranged as a ~~so called~~ heat pipe with a heat dissipation at least one of onto [[the]] an inner wall of [[the]] an upper region of the pipe liner and ~~and/or~~ through ~~its walls~~ a wall onto external heat exchangers and correspondingly [[the]] a necessary gas pressure ~~for this~~ is set in [[the]] a protective atmosphere inside the borehole.

7. (Currently Amended) The method ~~Method~~ according to claim 1 [[or 2]], wherein

~~characterised in that~~

~~particularly~~ dangerous storage objects, ~~for example nuclear fission materials,~~ are loaded into the technological caissons which are secured containers ~~of the most secure type,~~ for which purpose the elongated cylindrical containers are used ~~which are disclosed in the patent RU 2193799 entitled "Storage sites of fission materials"~~.

8. (Currently Amended) The method ~~Method~~ according to claim 1 [[or 2]], wherein an

~~characterised in that~~

[[the]] accomplished loading of the storage objects~~, for example the nuclear fission materials,~~ is protected against [[the]] an external physical influence

~~not only~~ with [[the]] an appropriate submersion into the borehole ~~but also~~ and with the use of protective materials ~~known per se, preferably lithium hydride, gadolinium, lead and others, in the~~ for loading of the upper caissons, and ~~in that on this basis the so-called~~ creating a shadow protection against at least one of external neutron radiation ~~and/or~~ hard gamma radiation ~~is created~~.

9. (Currently Amended) The method ~~Method~~ according to claim 1 [[or 2]], wherein

~~characterised in that~~

inside the underground bunker ~~used,~~ at least two ~~or more~~ borehole storage sites are created[[,]] and the lock devices of which are united by [[the]] transport corridors with a general robot chamber for [[the]] a remote-controlled overall equipment check for the caissons and the storage objects ~~contained in same~~, ~~as well as~~ and with a general zone for receiving into the underground bunker and for delivering from ~~this~~ the bunker the caissons having the storage objects.

10. (Currently Amended) The method ~~Method~~ according to claim 1 [[or 2]], wherein for a nearly

~~characterised in that~~

~~for the practically~~ complete exclusion of unauthorised access to the storage objects ~~which are~~ located in the borehole storage sites, after ~~their~~ loading and [[the]] hermetic sealing of the borehole mouth, the lock devices ~~used~~ are dismantled and removed from the underground bunker to be ~~accommodated~~ in an external central store, possibly being temporarily accommodated in other uniform storage sites for work processes to be carried out, and ~~in that~~ the gas-hydrodynamic guiding system is arranged on a vehicle~~, preferably on a car transport trailer,~~ which is moved to the location of the actual borehole storage sites only for [[the]] a time

needed to carry out the sanctioned scheduled work[[,]] and is then ~~also~~ moved to the above-mentioned central store.

11. (Currently Amended) The method ~~Method~~ according to claim 1 [[or 2]], wherein

~~characterised in that~~

when [[a]] the borehole storage site of relatively small depth is used~~, it is possible to use, instead of the above-mentioned caissons operated with sparging gas,~~ pontoon-like airtight floating tanks to which the storage objects are fastened~~, all the procedures of loading and unloading the borehole then being carried out with limited use of~~ and the ~~above-mentioned~~ gas subsystem ~~only for "pressing"~~ ~~presses~~ the technological fluid out of the borehole in the ~~case of "dry"~~ dry storage.

12. (Currently Amended) The method ~~Method~~ according to claim 1 [or 2], wherein

~~characterised in that~~

for reducing [[the]] a value of [[the]] a force ~~which is~~ necessary for plunging one of the caissons [[or]] and the floating pontoons into the technological fluid of the borehole storage site, some of the ~~above-mentioned~~ technological fluid is removed externally from the borehole using ~~an appropriate~~ a pump, [[the]] and an amount ~~preferably~~ corresponding to [[the]] a volume of [[the]] a next object plunging into ~~this~~ the technological fluid.

13. (Currently Amended) The method ~~Method~~ according to claim 1 [[or 2]], wherein

~~characterised in that~~

[[the]] a value of [[the]] a general positive buoyancy~~, which is~~ produced by the vertical assembly of the caissons and which ~~naturally~~ reduces with increasing immersion in the technological fluid, is measured by ~~means of~~

calculating remotely [[the]] a value of [[the]] a force ~~which is preferably~~ produced from [[the]] a side with a ram of the lock device ~~in the course of the~~ during vertical assembly of the caissons created during the ~~above-mentioned~~ cyclical submersion.

14. (Currently Amended) The method ~~Method~~ according to claim 1 [[or 2]], wherein

~~characterised in that~~

for carrying out [[the]] a remote-controlled monitoring of the borehole storage site, after termination of ~~the sanctioned~~ work ~~on same~~, [[the]] an underground bunker is hermetically sealed and in ~~said~~ the underground bunker and ~~as well as~~ directly in the borehole[[,]] a recommended excess gas pressure is generated technologically and structurally, and a [[the]] provided level ~~of which~~ is held and then continues to be automatically maintained~~, preferably~~ via radio channels from a central protection support point.

15. (Currently Amended) The ~~Apparatus for accomplishing~~ ~~the~~ method according to claim ~~one of claims~~ 1 [[to 14]], wherein for storing underground ~~preferably~~ ecologically dangerous substances,

~~characterised in that~~

~~it is equipped with a borehole and its~~ an apparatus comprises one of a borehole pipe ~~(column) or with~~ and a shaft column ~~which is provided~~ with one of a corresponding pipe column ~~or contains~~ and a plurality of individual boreholes with ~~their~~ pipe towers fixed into [[its]] walls, ~~in all cases~~ the base of the borehole pipes being hermetically sealable and there being fastened over [[the]] a mouth of ~~each~~ the borehole an underground bunker in which the lock device for carrying out [[the]] external loading and unloading is arranged with the technological secondary containers ~~used~~, in the form of caissons, in which the storage objects ~~themselves~~ are accommodated, and ~~in that~~ inside the borehole~~, in addition to its~~ a borehole pipe

~~there is fastened~~ and a technological pipe column[[,]] are fastened on [[the]] an outer side of which pipe ducts are secured, of which some are connected to the hydraulic subsystem and the remainder to the gas subsystem, including accompanying structural elements which are constituent parts of the complex gas-hydrodynamic system created.

16. (Currently Amended) The apparatus for the method ~~Apparatus~~ according to claim 15, wherein

~~characterised in that~~

the gas-hydraulic complex system for [[the]] remote-controlled work in the storage sites comprises three main subsystems~~, namely~~ including the hydraulic subsystem and the gas subsystem which are both equipped with ~~known~~ functional elements, ~~especially with~~ including hydraulic pumps and gas compressors having appropriate valve fittings, are fastened outside the underground bunker~~, for example on a car trailer,~~ and are connected to [[the]] a general control complex only for [[the]] a duration of the sanctioned work, ~~as well as~~ a third subsystem which is fastened inside the borehole storage site and includes the lock device ~~of the type known per se or of a type matched to the actual storage objects as well as~~ and a set of technological secondary containers in the form of caissons, ~~which have special features, however, and~~ in which the storage objects are ~~directly~~ arranged.

17. (Currently Amended) The apparatus for the method ~~Apparatus~~ according to claim 15 [[or 16]], wherein

~~characterised in that~~

the technological secondary containers in [[the]] a form of caissons as part of the above-mentioned third functional subsystem are [[so]] designed so that each caisson ~~is provided with~~ has an upper lid having openings, to which inner injection pipes are connected from below in an airtight manner, [[the]] a lower

cross-section of which is arranged in front of the lower lid of the caisson, ~~this~~ the lower lid having ~~being itself also provided with~~ openings, ~~the centres~~ centers of the openings lying [[the]] one above the other vertically with respect to the ~~centres~~ centers of the openings on the upper lid of the caisson and the storage objects being secured between ~~these~~ the lids, which are connected to a cylindrical outer wall, inside the ~~above-mentioned~~ caisson.

18. (Currently Amended) The apparatus for the method ~~Apparatus~~ according to claim 15 [[or 16]], wherein

~~characterised in that~~

the lowermost caisson ~~is provided with the~~ has a greatest calculated buoyancy, [[the]] a positive importance of which is guaranteed structurally at all levels of [[its]] submersion until ~~it rests~~ resting on the bottom of the borehole, and ~~in that~~ no storage objects are secured in this caisson and it ~~is provided with~~ has a central support platform and a hydraulic damper.

19. (Currently Amended) The apparatus for the method ~~Apparatus~~ according to claim 15 [[or 16]], wherein

~~characterised in that~~

in [[the]] a base region of the borehole, some of the ~~number of~~ pipe ducts ~~which are~~ fastened on the technological borehole pipe column and connected in ~~their~~ an upper region to the hydraulic subsystem[[,]] are secured by ~~their~~ lower ends to [[the]] a base plane of [[the]] a pipe liner and form with [[the]] an inner circumference of the borehole communicating vessels ~~of sorts~~, and ~~in that the~~ other pipe ducts[[,]] which are connected to the external gas subsystem~~, are provided~~ have at ~~their~~ lower ends ~~with~~ angular apertures ~~(nozzles)~~ for [[the]] a sparging gas supplied in a jet through the technological fluid to the lower caisson, the gas being fed through ~~this~~ the caisson continuously into all [[the]] higher arranged caissons

having storage objects, ~~in which process particularly~~ deep boreholes are formed with ~~a plurality of~~ intermediate zones for blowing gas through the lower caisson, which are distributed in [[the]] a depth of the borehole, and ~~these~~ the zones ~~are equipped with~~ have corresponding gas ducts ~~also having~~ with lower angular apertures ~~(nozzles)~~ for ~~a similar way of~~ supplying the sparging gas to ~~that~~ in the lower caisson~~, for example during its submersion and movement towards precisely these intermediate zones~~.

20. (Currently Amended) The apparatus for the method ~~Device~~ according to claim 15 [or 16], wherein

~~characterised in that~~

one or more pipe ducts[[,]] which are connected to the hydraulic subsystem[[,]] are connected to a separate pumping unit for periodically pumping the technological fluid out of the borehole from [[the]] a submersion plane[[,]] which is less than [[the]] a size of a [[the]] barometric column of ~~this~~ the fluid.

21. (Currently Amended) The apparatus for the method ~~Apparatus~~ according to claim 15 [[or 16]], wherein

~~characterised in that~~

in the plane of the borehole mouth, in front of [[its]] a sealed upper blocking closure, sliding supports~~, preferably some type of one-sided latch arrangements,~~ are secured to prevent [[the]] an uncontrollable rising of the loaded upper caisson and of the entire caisson assembly into [[the]] a region ~~of the arrangement~~ of the lower blocking closure of the lock device.